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**Section III. (REMARKS)**

The pending claims in the application are 1-8, 12-28, 30-33 and 35-43.

**Request for Rejoinder Reminder**

Applicants respectfully request rejoinder of method claims 19-28, 30-33 and 35-40 upon allowance of the pending composition claims 1-8, 12-18 and 40-43.<sup>1</sup> Towards that end, withdrawn method claims 19-21, 28, 30, 32 and 33 have been amended in a manner consistent with the pending composition claims.

**Provisional Double Patenting Rejection Under the Judicially Created Doctrine of Obviousness-Type Double Patenting**

In the December 20, 2005 Office Action, the Examiner provisionally rejected claims 1-18 under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-7, 9, and 11-14 of copending U.S. Patent Application No. 10/724,791. In addition, the Examiner provisionally rejected claims 1-7 and 12-18 under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-24 of copending U.S. Patent Application No. 10/790,535.

Applicants acknowledge the Examiner's provisional rejection of claims 1-18 under the judicially created doctrine of obviousness-type double patenting. Applicants agree to file a terminal disclaimer to said applications, if appropriate upon review of the claims of the presently pending application relative to those of U.S. Patent Application Nos. 10/724,791 and 10/790,535, when said rejections are the only ones remaining.

**Amendment to the Claims**

Claim 1 has been amended herein to include the limitations of original claim 11. Claim 19 has been correspondingly amended.

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<sup>1</sup> Rejoinder was previously requested in the response to the September 29, 2005 Office Action, filed October 7, 2005.

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Claim 16 has been amended herein to include the limitation of original claim 17. Claim 33 has been correspondingly amended.

Support for new claims 41-43 is inherently found in the instant application at page [0018].

No new matter has been added herein.

**Rejection of Claims and Traversal Thereof**

In the December 20, 2005 Office Action:

claims 1-6, 12-14, 16 and 17 were rejected under 35 U.S.C. §102(e) as being anticipated by Xu et al. (U.S. Patent Application Publication No. 20030125225);

claims 1-7, 12-14 and 16 were rejected under 35 U.S.C. §102(e) as being anticipated by Saga (U.S. Patent Application Publication No. 20040259357);

claims 15 and 18 were rejected under 35 U.S.C. 103(a) as being unpatentable over Xu et al. or Saga; and

claims 8-11 and 17 were rejected under 35 U.S.C. 103(a) as being unpatentable over Saga in view of Mullee (U.S. Patent No. 6,306,564).

These rejections are traversed and reconsideration of the patentability of the pending claims is requested in light of the following remarks.

**Rejections under 35 U.S.C. §102(e)**

1. In the December 20, 2005 Office Action, claims 1-6, 12-14, 16 and 17 were rejected under 35 U.S.C. §102(e) as being anticipated by Xu et al. (U.S. Patent Application Publication No. 20030125225) (hereinafter Xu). Applicants traverse said rejection.

Applicants have amended claim 1 herein to recite:

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**A supercritical fluid (SCF)-based composition, comprising a at least one co-solvent, at least one etchant species, and optionally at least one surfactant, wherein said at least one etchant comprises an alkyl phosphonium difluoride ((R)<sub>4</sub>PHF<sub>2</sub>), where R is a C<sub>1</sub>-C<sub>4</sub> alkyl group, and wherein said SCF-based composition is useful for etching sacrificial silicon-containing layers. (emphasis added)**

Importantly, claim 1 has been amended to include the limitation of original claim 11, which the Examiner impliedly found novel in view of Xu. Accordingly, claim 1, and claims 2-6 depending therefrom, is not anticipated by Xu.

With regards to claims 12-14, it is noted that claim 12, from which claims 13 and 14 depend, depends from claim 7, which the Examiner impliedly found novel in view of Xu. Accordingly, claims 12-14 are not anticipated by Xu.

Claim 16 has been amended herein to recite:

**“An etching composition, comprising a supercritical fluid (SCF), at least one co-solvent, at least one etchant species, and optionally at least one surfactant, wherein the etchant species is XeF<sub>2</sub>, and wherein said etching composition is useful for etching silicon.” (emphasis added)**

Xu relates to chemical formulations utilizing a supercritical fluid-based cleaning composition, which may further include co-solvent(s), surfactant(s), chelating agent(s) and/or chemical reactant(s). The relevant teaching in Xu recites the following:

“Another aspect of the invention relates to using traditional etching gases, such as, for example, sulfur hexafluoride (SF<sub>6</sub>), carbon tetrafluoride (CF<sub>4</sub>) and xenon difluoride (XeF<sub>2</sub>), in a supercritical form to achieve higher etch rates than are achievable by conventional etch processes, and also to avoid the need for plasmas to activate the etching species. [ ] The SCF, e.g., SF<sub>6</sub> or CF<sub>4</sub>, can be used neat or in combination with other SCFs. Additionally, co-solvent(s), surfactant(s), chelating agent(s), and/or active agent(s) can be added to the supercritical etchant cleaning formulation.” (see Xu, paragraph [0053]) (emphasis added)

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In other words, Xu teaches that  $\text{XeF}_2$  may be used as the neat SCF, or it CAN be used in combination with other SCFs, or it CAN include co-solvent(s), surfactant(s), chelating agent(s), and/or active agent(s).

A reference is effective only for that which it clearly and definitively discloses. If a reference can be variously interpreted so that it may, in one interpretation, and may not, in another interpretation, constitute an anticipation of an applicant's claim, an anticipation rejection under 35 U.S.C. §102 based on such reference is improper. In re Hughes, 145 U.S.P.Q. 467 (CCPA 1965).

In the present case, the Xu composition may include another SCF such as  $\text{CO}_2$  and/or it may include co-solvent(s). Clearly, there are multiple interpretations of this specific Xu teaching and thus Xu does not clearly and definitively disclose a composition including co-solvent and  $\text{XeF}_2$ , as claimed by applicants herein in claim 17. Accordingly, Xu does not anticipate applicants' claim 16, or claim 17 depending therefrom.

Withdrawal of the rejection of claims 1-6, 12-14, 16 and 17 under §102(e) in view of Xu is respectfully requested.

2. In the December 20, 2005 Office Action, claims 1-7, 12-14 and 16 were rejected under 35 U.S.C. §102(e) as being anticipated by Saga (U.S. Patent Application Publication No. 20040259357). Applicants traverse such rejection.

Saga relates to a surface treatment method applicable to cleaning of a semiconductor surface having fine structural bodies such as high-aspect ratio electrode patterns.

By the Examiner's own admission, Saga fails to teach the use of bifluorides as etchants. Accordingly, applicants' claim 1, and claims depending therefrom, is not anticipated by Saga.

With regards to claim 16, claim 16 has been amended to include the limitation of original claim 17. Since claim 17 was impliedly found novel in view of Saga, claim 16 as amended is novel in view of Saga.

Withdrawal of the rejection of claims 1-7, 12-14, and 16 under §102(e) in view of Saga is respectfully requested.

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**Rejections under 35 U.S.C. §103(a)**

1. In the December 20, 2005 Office Action, claims 15 and 18 were rejected under 35 U.S.C. 103(a) as being unpatentable over Xu et al. or Saga. Applicants traverse such rejection.

As discussed hereinabove, Xu fails to motivate, teach or suggest the inclusion of a bifluoride etchant species in the composition, much less a phosphonium bifluoride species, as claimed by applicants herein. Accordingly, Xu does not does not motivate, teach or suggest every limitation of applicants' claim 1, and claims 15 and 18 depending therefrom, and thus, one of the requirements needed to establish a *prima facie* case of obviousness in view of Xu has not been met. See, *In re Royka*, 180 USPQ 580 (CCPA 1974).

With regards to Saga, by the Examiner's own admission, Saga fails to teach the use of bifluorides as etchants, much less a phosphonium bifluoride species, as claimed by applicants herein. Accordingly, Saga does not does not motivate, teach or suggest every limitation of applicants' claim 1, and claims 15 and 18 depending therefrom.

Importantly, as discussed hereinabove, claim 1 has been amended herein to include the limitation of original claim 11. The Examiner impliedly found original claim 11 both novel and non-obvious in view of both Xu and Saga. Accordingly, claim 1 as amended is novel and non-obvious in view of Xu and Saga.

Withdrawal of the rejection of claims 15 and 18 under §103 in view of Xu or Saga is respectfully requested.

2. In the December 20, 2005 Office Action, claims 8-11 and 17 were rejected under 35 U.S.C. 103(a) as being unpatentable over Saga in view of Mullee (U.S. Patent No. 6,306,564). Applicants traverse such rejection.

According to the Examiner:

"It would have been obvious to one having ordinary skill in the art . . . to have replaced ammonium fluoride with amonium [sic] bifluoride as an etchant in the etching composition as suggested

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by Mullee in Saga since the substitution of art recognized equivalence as suggested by Mullee [sic] is within level [sic] of those skilled in the art." (see December 20, 2006 Office Action, page 6, lines 13-17)

Applicants vigorously disagree.

Importantly, the mere fact that references can in some way or ways be combined or modified does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination. *In re Mills*, 16 U.S.P.Q.2d 1430 (Fed. Cir. 1990).

Four treatment methods are disclosed in Saga: the first relates to the addition of an ammonium hydroxide compound as a co-solvent or a reactant to a SCF; the second relates to the addition of an alkanolamine compound as a co-solvent or a reactant to a SCF; the third relates to the addition of an amine fluoride compound as a co-solvent or a reactant to a SCF; and the fourth relates to the addition of HF as a co-solvent or a reactant to a SCF.

Mullee relates to using a chemical, such as organic and/or inorganic stripping solvent(s), supported by supercritical CO<sub>2</sub> to remove resist material from the surface of a semiconductor wafer. The stripping chemicals listed include N-methyl pyrrolidone, diglycol amine, hydroxyl amine, tertiary amines, catechol, ammonium fluoride, ammonium bifluoride, methylacetoacetamide, ozone, propylene glycol monoethyl ether acetate, acetylacetone, dibasic esters, ethyl lactate, CHF<sub>3</sub>, BF<sub>3</sub>, other fluorine containing chemicals, or a mixture of any of the above chemicals.

It is initially noted that both Saga and Mullee fail to motivate, teach or suggest a SCF composition including a phosphonium fluoride species, as claimed by applicants herein in claim 1. In addition, both Saga and Mullee fail to motivate, teach or suggest a SCF composition including XeF<sub>2</sub>, as claimed by applicants herein in claim 16.

According to the Examiner, the substitution of art recognized equivalents, i.e., ammonium bifluoride for ammonium fluoride, as suggested by Mullee is within the level of one skilled in the art. Importantly, Mullee does not suggest the art recognized equivalence of ammonium bifluoride and ammonium fluoride – Mullee merely lists a number of possible stripping chemicals which

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otherwise are generally classified as fluorine-containing compounds, chelating agents (e.g., methylacetoacetamide), solvents (e.g., ethyl lactate) or oxidizing agents (e.g., ozone).

As stated in the MPEP §2144.06:

“In order to rely on equivalence as a rationale supporting an obviousness rejection, the equivalency must be recognized in the prior art, and cannot be based on applicant's disclosure or the mere fact that the components at issue are functional or mechanical equivalents. *In re Ruff*, 256 F.2d 590, 118 USPQ 340 (CCPA 1958) (The mere fact that components are claimed as members of a Markush group cannot be relied upon to establish the equivalency of these components)”

In the present case, the Examiner is relying on the fact that Mullee introduced both ammonium fluoride and ammonium bifluoride in a list of stripping chemicals to show equivalence. Using the Examiner's logic, that would mean that ammonium fluoride and ozone may be considered equivalents or perhaps ammonium fluoride and dibasic esters may be considered equivalents. In short, Mullee was not enumerating art-recognized equivalents of ammonium fluoride, but rather chemicals known to remove resist, its residue or organic contaminants from wafers. This hardly amounts to an establishment of art-recognized equivalents.

The foregoing compels the conclusion that the rejection is based solely on hindsight, which is impermissible. The courts have made it clear that Examiners must not use the applicants' own disclosure as a blueprint to arbitrarily piece together isolated features described in the references (where no teaching or suggestion to combine the references is present) in an attempt to re-create applicants' claimed invention.

Further, the Examiner is respectfully reminded that chemistry remains an unpredictable art – where is the objective proof that ammonium fluoride (as taught in Saga) and alkyl phosphonium difluoride (as claimed by applicants herein) are art-recognized equivalents and readily interchangeable?

Considered *in toto*, claim 1, and claims 8-11 depending therefrom, are non-obvious over Saga in view of Mullee.

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In addition, it is noted that the Examiner stated that  $\text{XeF}_2$  is a well-known and commercial available etchant for use in semiconductor processing and as such, "it would have been obvious to those skill [sic] in the art to select a suitable known etchant for removing silicon material" as in claim 16. Applicants vigorously disagree.

Respectfully, it is initially noted that combining ingredients is not necessarily obvious because of the underlying problems of compatibility and stability of chemical ingredients which one skilled in the art needs to ascertain before coming up with the inventive composition.

In the present case, the Examiner appears to be stating that it would be obvious to try adding  $\text{XeF}_2$  to a SCF etching composition because  $\text{XeF}_2$  has been established as a well known silicon etchant. "Obvious to try" is not the standard for establishing a *prima facie* case of obviousness. Instead, the Examiner must provide "objective evidence in the prior art or that knowledge generally available to one of ordinary skill in the art" that would lead that individual to combine  $\text{XeF}_2$  with an SCF. See, *In re Fritch*, 23 U.S.P.Q.2d 1780, 1783 (Fed. Cir. 1992) (emphasis added).

In short, there is no motivation, teaching or suggestion in either Saga or Mullee to formulate an SCF composition comprising  $\text{XeF}_2$ . Accordingly, applicants respectfully request that the rejection of claim 17 (now 16) under §103 over Saga in view of Mullee be withdrawn

#### Fees Payable

Five (5) dependent claims have been cancelled, three (3) dependent claims have been added, and two (2) dependent claims have been converted to independent claims herein. As such, an added claims fee of  $[(2 \times \$200.00) + (3 \times \$50.00)] - (5 \times \$50.00) = \$300.00$  is due.

The total fee of \$300.00 is authorized to be withdrawn from Deposit Account No. 13-4365 of Moore & Van Allen PLLC.



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**Conclusion**

Claims 1-8, 12-18, and 41-43 are in form and condition for allowance. Favorable action is hereby requested. If any additional issues remain, the Examiner is requested to contact the undersigned attorney at (919) 286-8090 to discuss same.

Respectfully submitted,

MOORE & VAN ALLEN PLLC

Date: March 20, 2006

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